A Study on the Correlation Between Earthquakes and Nuclear Power Plants Analyzed Using SNS Big Data

Seungkook Roh[1*], Ik Jeong[1], Yongjun Kim[2], Kibo Sim[2], and Jaesung Lee[3]

[1]Korea Atomic Energy Research Institute,lll,Daedeok-daero 989beon-gil, Yuseong-gu, Daejeon, Republic of Korea

[2]KNEA, 1418 Nambusunhwanno, Geumcheon-gu, Seoul, Republic of Korea

[3]GoGreat, 551-24, Yangcheon-ro, Gangseo-gu, Seoul, Republic of Korea

*skroh@kaeri.re.kr

1. Introduction

Several earthquakes occurred in Korea in 2016. These earthquakes were large enough to instill a fear of nuclear power plant accidents in Koreans owing to the influence of Fukushima in Japan [1]. Several media outlets have reported a great deal about earthquakes and nuclear power plants, but it was not enough to specifically tell how the public opinion has changed in real time. A big data analysis is a very useful methodology to solve these problems and to explain these situations. This study analyzed the reactions of the Korean people to earthquakes and nuclear power plants using an SNS Big Data Analysis Method.

2. Methodology and Data

2.1 Methodology

The method of analyzing atypical big data has a great advantage in the collection and analysis of people's unfiltered thoughts in real time [2]. While many analytical methodologies have focused on revealing causal relationships in the past, big data analytic methods find their meaning through correlations. First, the SNS analysis method is used to collect and analyze contents related to an online SNS and newspaper articles such as Twitter and Facebook. Second, the analysis method mainly consists of a statistical correlation analysis or visualization analysis [3].

2.2 Data

For a big data analysis, this study collected data from various online SNSs and media such as Twitter, Naver blog, and Facebook (the data were collected by GoGreat). The data collection period was from January 1, 2016 to December 14, 2016. The amount of data related to nuclear power and earthquakes during this period were 4,735,492 for Twitter, 1,552,638 for Naver, and 43,430 for other media. After removing the meaningless data, 367,743 Twitter, 31,281 Naver, and 3,833 media data were analyzed.

3. Results and Discussion

Fig. 1 shows that the occurrence of earthquakes is highly correlated with nuclear power plants. Normally, the average data generation of nuclear power plants is between 600 and 800. However, when an earthquake occurred in Kumamoto in April 2016, 47,000 earthquake-related data occurred, and at the same time, 8,000 nuclear power plant data were generated. In July 2016, when an earthquake occurred in Ulsan, 47,000 earthquake-related data occurred, and 12,000 nuclear power plant data were generated. When an earthquake occurred in Gyeongju in September 2016, 280,000 earthquake-related data occurred, and 42,000 nuclear power plant data were generated, simultaneously.
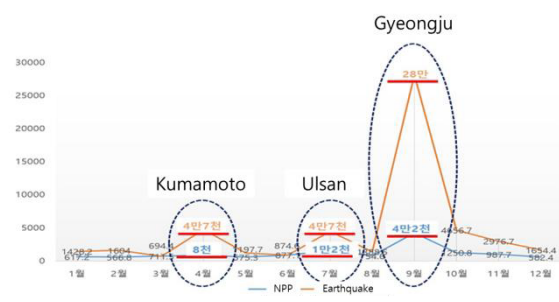

Fig. 1. Data trends for earthquakes and nuclear power plants in 2016.

As shown in Fig. 2, 2,188 data were generated 95 times within 2 hours from 20:33 at the time of the earthquake in Ulsan. The amount of data decreased sharply, and after 4 hours, the data amount reached a normal level.
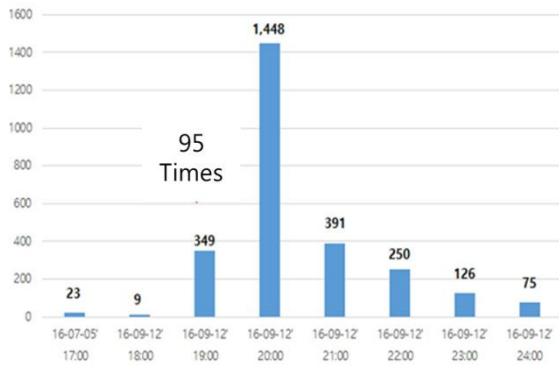

Fig. 2. Data trends for earthquake in Ulsan.

As shown in Fig. 3, 5,291 data were generated 264 times within 2 hours from 20:32 at the time of the earthquake in Gyeongju. The amount of data decreased gradually after 3 hours.
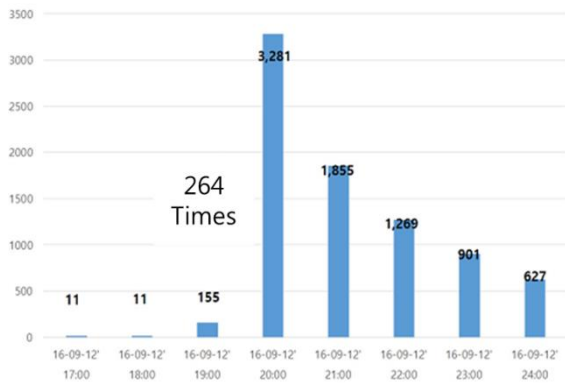

Fig. 3. Data trends for earthquake in Gyeongju.

4. Conclusions

The above results show that many people simultaneously express their opinions about nuclear power plants when an earthquake occurs. In particular, it can be seen that when an earthquake occurs in Korea, it results in more opinions about nuclear power plants. In addition, this study found that the date of the earthquake and nuclear power plant mostly occurred within 2 hours after the earthquake. Based on these results, this study suggests the following policy implications.

First, nuclear power plants will have to provide sufficient safeguards to ensure that the public can be assured after an earthquake.

Second, the government should disclose the safety of nuclear power plants through an online SNS and the media within two hours after an earthquake.

This study analyzed the correlation between earthquakes and nuclear power plants using atypical big data and suggested policies for it. In addition, this study did not conduct an emotional analysis of people regarding earthquakes and nuclear power plants. The limitations of this study are not comparing the data generated by each region. These limitations will be dealt with in future studies.

REFERENCES

[1] Simons, M., et al., The 2011 magnitude 9.0 Tohoku-Oki earthquake: Mosaicing the megathrust from seconds to centuries. science, 2011. 332(6036): p. 1421-1425.
[2] Roh, S., Big Data Analysis of Public Acceptance of Nuclear Power in Korea. Nuclear Engineering and Technology, 2017.
[3] Chen, M., et al., Big data analysis, in Big Data. 2014, Springer. p. 51-58.